H. ROOS.

INSULATING COIL.

APPLICATION FILED SEPT. 17, 1912.

1,118,446.

Patented Nov. 24, 1914.

Fig. 1.

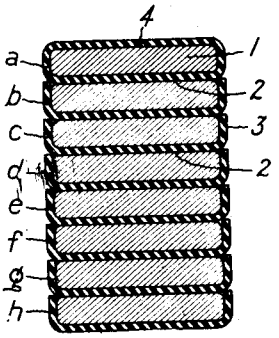


Fig. 2.

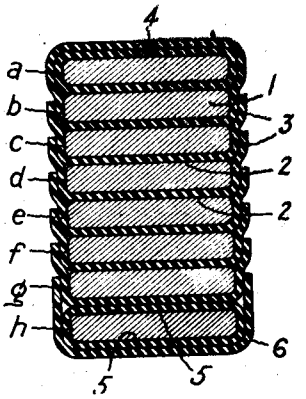


Fig. 3.

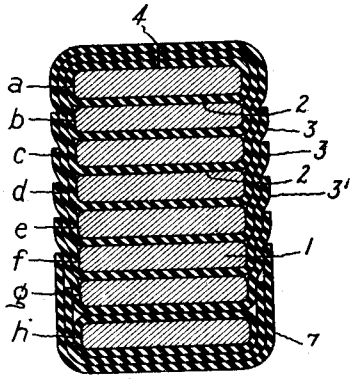
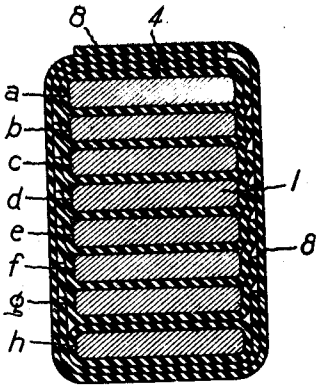


Fig. 4.



Witnesses:

Chas. S. Stokes

J. Ellis Glen

Inventor:

Hermann Roos,

by Albert G. Davis

His Attorney

UNITED STATES PATENT OFFICE.

HERMANN ROOS, OF CHARLOTTENBURG, GERMANY, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

INSULATING-COIL.

1,118,446. Specification of Letters Patent. Patented Nov. 24, 1914.

Application filed September 17, 1912. Serial No. 720,784.

To all whom it may concern:

Be it known that I, HERMANN ROOS, a subject of the Emperor of Germany, residing at Charlottenburg, Germany, have invented certain new and useful Improvements in Insulating-Coils, of which the following is a specification.

This invention relates to the insulation of coils for electrical machines, and especially those made of flat conductors. In such coils, a distinction must be observed between the insulation which separates successive turns and that which protects the coil from external bodies, for example, the iron body surrounding it. The former has to withstand only the small potential difference between two adjacent turns, but the latter must be able to resist the potential difference between the sum of the turns and the iron body or ground. It is therefore necessary to provide a stronger insulation between the coils and ground than between adjacent turns. One mode of accomplishing this is by placing layers of paper between the turns and then wrapping the whole coil with insulating material. Another way of proceeding is to wrap each turn completely and then cover the whole coil with additional insulation. But in each case the external insulation must be made specially and cannot be applied until after the intermediate insulation. Moreover, the outside wrapping cannot be applied by pressure of the coil on all sides, because the insulating material will inevitably bulge and fold over. This produces air spaces which not only impair the heat radiation but favor the formation of ozone and the development of nitrogen acids which cause a deterioration of the insulation.

According to the present invention, the external insulation of flat wound coils for electrical machines is pressed on all sides without bulging or folding. The intermediate layers of insulation are made broader than the conductors and are bent around the sides of the coil in U-shape. The total width of the insulation in comparison to the width of the coil is important for the application of the process, and is so planned in accordance with the voltage, that the bent-over ends of the intermediate insulation cover one or more turns, and the number of the scale-like superposed overlapping parts affords a sufficient insulation between the coil and ground.

In accompanying drawing, Figure 1 is a cross section of a coil having the intermediate insulation of each turn overlapping its edges, Fig. 2 is a similar section showing the overlapping portions covering the edges of two coils, Fig. 3 shows such portions overlapping three coils, and Fig. 4 shows a coil like Fig. 2 with an inclosing wrapping.

In each figure I have represented in cross section a coil having a plurality of turns of a flat conductor 1. Interposed between adjacent turns *a b c*, etc., is a sheet 2 of insulating material. This material may be paper or other suitable insulating material. The sheets are wider than the conductor so as to form flaps 3 which are turned up at each side to cover the edges of the conductor. In Fig. 1 the upturned flaps are only wide enough to cover the edges of one turn of the coil, the edge of each flap fitting closely against the next sheet of insulation. In Fig. 2 the flaps on each sheet are wide enough to overlap not only the edges of the turns lying upon that sheet but also the edges of the next turn above; while in Fig. 3 the flaps are still wider and overlap two turns above the one beneath which the sheet is applied. In Fig. 1 again, the sheet applied to the upper outermost turn *a* is wide enough to inclose said turn entirely, as shown, the edges meeting at 4. The result of this is that the external insulation of the entire coil is of the same thickness all around. In Fig. 2 the flaps of the second turn *b* are made wide enough to overlap completely the flaps of the upper turn *a*, thus giving a double thickness of insulation at all outside points. In this coil it is also desirable to give extra protection to the other outermost turn *h* by continuing its adjacent sheet of insulation 5 entirely around it before applying the additional sheet 6 which affords the double thickness for its under side and edges.

In Fig. 3 the upper turn *a* is protected by three thicknesses of insulation, the flaps of turns *a b* and *c* being made large enough to overlap the upper one. The lower turn *h* has double insulation on one side as in Fig. 2, but there is an additional sheet 7 applied to its outer side with flaps running up over the edges of the two turns next above.

Before putting on the insulating material, it is provided on both sides with an adhesive material which becomes soft by

heating. After the coil has been protected by the bending over of the flaps of the interposed insulating sheets, it is subjected to pressure on all sides, being heated at the same time. This not only causes the insulating material to adhere to the surfaces of the conductor, but also unites the several layers of insulating material so that a completely closed covering for the coil is provided, and harmful air spaces are prevented. If it is desired to have a still thicker insulation, additional layers 8 can be wrapped around the coil, as shown in Fig. 4; the first insulation forming an excellent foundation for this extra one. The additional layers are caused to adhere to the others by the use of adhesive coatings coupled with the application of heat and pressure if so desired.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof; but I desire to have it understood that the apparatus shown is only illustrative, and that the invention can be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. A coil for an electrical machine consisting of a plurality of turns of a flat conductor and sheets of insulation interposed between said turns, each sheet being wide enough to form flaps which will cover the edges of adjacent turns, the sheet between the two uppermost turns being wide enough to completely inclose the upper turn.

2. A coil for an electrical machine, consisting of a plurality of turns of a flat conductor, and sheets of insulation interposed between said turns, each sheet being wide enough to form flaps to turn up and cover the edges of said turns, the sheets adjacent to the outermost turns being also wide enough to completely inclose said turns.

3. A coil for an electrical machine consisting of a plurality of turns of a flat conductor and sheets of insulation interposed between said turns, each sheet being wide enough to form flaps to turn up and cover the edges of said turns, the sheets adjacent to the uppermost turns being wide enough to completely inclose said turns, and additional insulation covering the turns at the lower end of the coil to the same thickness as the overlapping sheets at the upper end.

In witness whereof, I have hereunto set my hand.

HERMANN ROOS.

Witnesses:
ERICH ÜBERLÉE,
THEODOR SÄHRIG.